FORM PTO-1390 (Modified) (REV 11-2000) U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER	U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR)
BERGLUNDS P0021	10/018985

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/SE00/01286	**JUNE 18, 2000 (18.06.00)**	**JUNE 21, 1999 (21.06.99)**

TITLE OF INVENTION
MICRO TOOLS

APPLICANT(S) FOR DO/EO/US
INGANAS et al.

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include itens (5), (6), (9) and (24) indicated below.
4. ☒ The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371 (c) (2))
   a. ☐ is attached hereto (required only if not communicated by the International Bureau).
   b. ☒ has been communicated by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
   a. ☒ is attached hereto.
   b. ☐ has been previously submitted under 35 U.S.C. 154(d)(4).
7. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))
   a. ☐ are attached hereto (required only if not communicated by the International Bureau).
   b. ☐ have been communicated by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☐ have not been made and will not be made.
8. ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).
10. ☐ An English language translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).
11. ☐ A copy of the International Preliminary Examination Report (PCT/IPEA/409).
12. ☒ A copy of the International Search Report (PCT/ISA/210).

Items 13 to 20 below concern document(s) or information included:

13. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
14. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
15. ☒ A **FIRST** preliminary amendment.
16. ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
17. ☐ A substitute specification.
18. ☐ A change of power of attorney and/or address letter.
19. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825.
20. ☐ A second copy of the published international application under 35 U.S.C. 154(d)(4).
21. ☐ A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
22. ☒ Certificate of Mailing by Express Mail
23. ☐ Other items or information:

Rec'd PCT/PTO 19 DEC 2001

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR)	INTERNATIONAL APPLICATION NO.	ATTORNEY'S DOCKET NUMBER
10/018985	PCT/SE00/01286	BERGLUNDS P0021

24. The following fees are submitted:.

BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)) :

		CALCULATIONS PTO USE ONLY
☒	Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO	**$1040.00**
☐	International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO	**$890.00**
☐	International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO	**$740.00**
☐	International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4)	**$710.00**
☐	International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4)	**$100.00**
	ENTER APPROPRIATE BASIC FEE AMOUNT =	**$1,040.00**
	Surcharge of **$130.00** for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (e)).	**$0.00**

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	
Total claims	35 - 20 =	15	x $18.00	**$270.00**
Independent claims	1 - 3 =	0	x $84.00	**$0.00**
Multiple Dependent Claims **(check if applicable)**.			☐	**$0.00**
	TOTAL OF ABOVE CALCULATIONS =			**$1,310.00**
☒	Applicant claims small entity status. See 37 CFR 1.27). The fees indicated above are reduced by 1/2.			**$655.00**
	SUBTOTAL =			**$655.00**
	Processing fee of **$130.00** for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (f)). +			**$0.00**
	TOTAL NATIONAL FEE =			**$655.00**
	Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) **(check if applicable).** ☐			**$0.00**
	TOTAL FEES ENCLOSED =			**$655.00**
			Amount to be: refunded	$
			charged	$

a. ☐ A check in the amount of _____ to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. _____ in the amount of _____ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. **08-1391** A duplicate copy of this sheet is enclosed.

d. ☒ Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. **Credit card information should not be included on this form.** Provide credit card information and authorization on PTO-2038.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

Norman P. Soloway, Esq.
HAYES, SOLOWAY, HENNESSEY,
GROSSMAN & HAGE, P.C.
130 W. Cushing Street
Tucson, Arizona 85701
USA

SIGNATURE

Norman P. Soloway
NAME

24,315
REGISTRATION NUMBER

December 19, 2001
DATE

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE APPLN. OF: INGANÄS et al.

FOR: MICRO TOOLS

DOCKET: BERGLUNDS P0021

BOX PCT
The Assistant Commissioner of Patents
Washington, D.C. 20231

PRELIMINARY AMENDMENT

Dear Sir:

Applicants respectfully request that the following amendments be made to the above-identified application prior to examination.

IN THE CLAIMS:

Please amend claims 5-11 and 14-22 as follows:

5. (Amended) Tool arrays according to claim 1, characterized in that the mechanical movement is used to position a biological structure.

6. (Amended) Tool arrays according to claim 1, characterized in that the mechanical movement is used to hold a biological structure.

7. (Amended) Tool arrays according to claim 1, characterized in that the mechanical movement is used to cut a biological structure.

8. (Amended) Tool arrays according to claim 1, characterized in that the mechanical movement is used to dilate a biological structure.

9. (Amended) Tool arrays according to claim 1, characterized in that the mechanical movement is used to fortify a biological structure.

HAYES, SOLOWAY,
NNESSEY, GROSSMAN
& HAGE, P.C.
P.O. BOX 3042
130 W. CUSHING ST.
CSON, AZ 85702-3042

TEL. 520.882.7623
FAX. 520.882.7643

10. (Amended) Tool arrays according to claim 1, characterized in that the mechanical movement is used to implant a biological structure.

11. (Amended) Tool arrays according to claim 1, characterized in that a number of identical tools are located on a tool array extending along a length of the cannula, catheter or needle, and wherein the actuation of a tool closest to the exit of the catheter is arranged to release a tool from the tool array and is arranged to leave it at the point of exit of the catheter in order to mount the tool at/in some biological structure.

14. (Amended) Tool arrays according to claim 1, characterized in that the individual tool is a clip arranged to join biological tissues or tissue parts, and arranged to hold the said tissues or tissue parts to allow healing.

15. (Amended) Tool arrays according to claim 1, characterized in that the individual tool is an expandable cylindrical object designed to be inserted, in a contracted state, into a biological tube, and arranged to become expanded to keep said tube in an expanded state or to join two or more biological tubes.

16. (Amended) Tool arrays according to claim 1, characterized in that the individual tool is a scissors.

17. (Amended) Tool arrays according to claim 1, characterized in that the individual tool is a knife, which is arranged on an actuator, being arranged for linear and/or angular movement.

18. (Amended) Tool arrays according to claim 1, characterized in that the individual tool is a sharp needle that is arranged on an actuator being arranged for linear and/or angular movement.

19. (Amended) Tool arrays according to claim 1, characterized in that the individual tool is a dilator.

HAYES, SOLOWAY,
NNESSEY, GROSSMAN
& HAGE, P.C.
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CSON, AZ 85702-3042

TEL. 520.882.7623
FAX. 520.882.7643

20. (Amended) Tool arrays according to claim 1, characterized in that the individual tool is a clamp.

21. (Amended) Tool arrays according to claim 1, characterized in that the individual tool is a tweezers.

22. (Amended) Tool arrays according to claim 1, characterized in that the polymer micromuscles are built of layers, of which at least one is a conjugated polymer.

Please add new claims 26-35 as follows:

--26. Tool arrays according to claim 11, characterized in that each individual tool is a clip arranged to join biological tissues or tissue parts, and arranged to hold the said tissues or tissue parts to allow healing.

27. Tool arrays according to claim 11, characterized in that each individual tool is an expandable cylindrical object designed to be inserted, in a contracted state, into a biological tube, and arranged to become expanded to keep said tube in an expanded state or to join two or more biological tubes.

28. Tool arrays according to claim 11, characterized in that the individual tool is a scissors.

29. Tool arrays according to claim 11, characterized in that each individual tool is a knife, which is arranged on an actuator, being arranged for linear and/or angular movement.

30. Tool arrays according to claim 11, characterized in that each individual tool is a sharp needle that is arranged on an actuator being arranged for linear and/or angular movement.

31. Tool arrays according to claim 11, characterized in that each individual tool is a dilator.

HAYES, SOLOWAY,
NNESSEY, GROSSMAN
& HAGE, P.C.
P.O. BOX 3042
130 W. CUSHING ST.
CSON, AZ 85702-3042

TEL. 520.882.7623
FAX. 520.882.7643

32. Tool arrays according to claim 11, characterized in that each individual tool is a clamp.

33. Tool arrays according to claim 11, characterized in that each individual tool is a tweezers.

34. Tool arrays according to claim 11, characterized in that the polymer micromuscles are built of layers, of which at least one is a conjugated polymer.

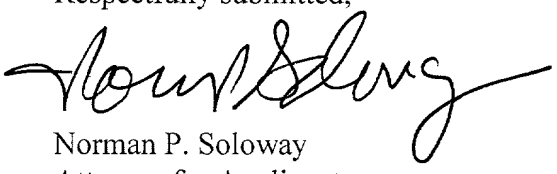
35. Tool arrays according to claim 34, characterized in that the conjugated polymer is selected from the group consisting of pyrrole, aniline, thiophene, para-phenylene, vinylene, and phenylene polymers and copolymers including substituted forms of the different monomers.--

REMARKS

The claims have been revised to eliminate multiple dependencies and new claims have been added to further scope the invention. No new matter is believed entered by any of the foregoing amendments. Pursuant to 37 CFR 1.121, a marked copy of the amended claims showing the changes made therein accompanies this amendment.

The filing fees have been calculated based on the claims as amended. In the event there are any fee deficiencies or additional fees are payable, please charge them (or credit any overpayment) to our Deposit Account No. 08-1391.

Respectfully submitted,



Norman P. Soloway
Attorney for Applicant
Reg. No. 24,315

HAYES, SOLOWAY,
LNNESSEY, GROSSMAN
& HAGE, P.C.
P.O. BOX 3042
130 W. CUSHING ST.
CSON, AZ 85702-3042

TEL. 520.882.7623
FAX. 520.882.7643

CERTIFICATE OF EXPRESS MAILING

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I hereby certify that this paper and the papers listed thereon are being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated above, and is addressed to: Assistant Commissioner of Patents, Washington, D.C. 20231.

Name of person mailing Sharon McKniff

Signature of person mailing Sharon McKniff

HAYES, SOLOWAY,
HENNESSEY, GROSSMAN
& HAGE, P.C.
P.O. BOX 3042
130 W. CUSHING ST.
TUCSON, AZ 85702-3042

TEL. 520.882.7623
FAX. 520.882.7643

MARKED COPY OF AMENDED CLAIMS

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MARKED COPY OF AMENDED CLAIMS

5. (Amended) Tool arrays according to [one or more of claims 1-4] claim 1, characterized in that the mechanical movement is used to position a biological structure.

6. (Amended) Tool arrays according to [one or more of claims 1-4] claim 1, characterized in that the mechanical movement is used to hold a biological structure.

7. (Amended) Tool arrays according to [one or more of claims 1-4] claim 1, characterized in that the mechanical movement is used to cut a biological structure.

8. (Amended) Tool arrays according to [one or more of claims 1-4] claim 1, characterized in that the mechanical movement is used to dilate a biological structure.

9. (Amended) Tool arrays according to [one or more of claims 1-4] claim 1, characterized in that the mechanical movement is used to fortify a biological structure.

10. (Amended) Tool arrays according to [one or more of claims 1-4] claim 1, characterized in that the mechanical movement is used to implant a biological structure.

11. (Amended) Tool arrays according to [one or more of claims 1-4] claim 1, characterized in that a number of identical tools are located on a tool array extending along a length of the cannula, catheter or needle, and wherein the actuation of a tool closest to the exit of the catheter is arranged to release a tool from the tool array and is arranged to leave it at the point of exit of the catheter in order to mount the tool at/in some biological structure.

14. (Amended) Tool arrays according to [one or more of claims 1-13] claim 1, characterized in that the individual tool is a clip arranged to join biological tissues or tissue parts, and arranged to hold the said tissues or tissue parts to allow healing.

15. (Amended) Tool arrays according to [one or more of claims 1-13] claim 1, characterized in that the individual tool is an expandable cylindrical object designed to be inserted, in a contracted state, into a biological tube, and arranged to become expanded to keep said tube in an expanded state or to join two or more biological tubes.

16. (Amended) Tool arrays according to [one or more of claims 1-13] claim 1, characterized in that the individual tool is a scissors.

17. (Amended) Tool arrays according to [one or more of claims 1-13] claim 1, characterized in that the individual tool is a knife, which is arranged on an actuator, being arranged for linear and/or angular movement.

18. (Amended) Tool arrays according to [one or more of claims 1-13] claim 1, characterized in that the individual tool is a sharp needle that is arranged on an actuator being arranged for linear and/or angular movement.

19. (Amended) Tool arrays according to [one or more of claims 1-13] claim 1, characterized in that the individual tool is a dilator.

20. (Amended) Tool arrays according to [one or more of claims 1-13] claim 1, characterized in that the individual tool is a clamp.

21. (Amended) Tool arrays according to [one or more of claims 1-13] claim 1, characterized in that the individual tool is a tweezers.

22. (Amended) Tool arrays according to [one or more of claims 1-13] claim 1, characterized in that the polymer micromuscles are built of layers, of which at least one is a conjugated polymer.

Micro tools

This invention concerns micro-surgical tools that can be delivered through or by a catheter or needle. These tools or micro-structures can be used to adapt, assemble, separate, fortify, dilate, close and hold biological structures inside the body during and after surgery. The tools may be stents, valves, clips, nets, knives, scissors, dilators, clamps, tweezers etc.

Introduction

The use of microstructures to assemble, fortify or dilate biological structures inside the body during and after surgery can help the surgeon in a number of ways. The operation of electrically actuated tools can help the surgeon to simultaneously position, operate manually, and observe. By positioning the tool by hand and separately operating it through external control (i.e. footswitch, voice control, other software-control) a much higher degree of precision is expected. In microsurgery, this is an especially desired advantage.

To be able to apply, beforehand or during an invasive procedure, a tool of a required size and geometry - designed for the purpose of cutting, drilling, holding, dilating, suturing, adapting or supporting - from tools that, for example, could be introduced through, placed inside or located at the end of a catheter or needle, is another desired function, requiring development of microactuators.

-The application of structures in or introduced through a catheter or needle is of particular interest at the application of tools, which are to be left at the site after insertion, and which have to execute their function for some limited time duration. The first example here is that of clips for surgery, sub-millimeter to millimeter structures, which would be used to hold two separated biological structures joined, for example during a healing period (Fig.1A - 1C).
-Another example is that of structures for controlling the flow through blood vessels. The simplest level is that of a clip used to prevent blood flow to a biological structure downstream in the blood flow. Such a clip, or series of clips, would be mounted and left to hold a firm grip

on the blood vessel and thus to prevent the flow of blood. In Figure 2 is shown a series of structures suitable for constricting blood vessels.

-The third example is at a somewhat more complex level with structures built in a geometry where they could be used inside or outside tube-like structures, as so called stents to dilate a stenotic area or to internally or externally fortify or join the structure(s) (Figure 5A and 5B). Stents are of particular interest since they are to be inserted inside the tube, then to be left there to expand a stenotic (examples: blood vessel, biliary duct) or to fortify a weak (examples: blood vessel with aneurysm, divided biliary duct) part of a tubular structure .

Arrays of fingers could be used to hold cylindrical objects, such as nerves and nerve fibers, or blood vessels. With the help of microactuators holding the structures (Fig. 3A - 3B), adjacent microstructures operating as neural sensing or activating electrodes, will enable recording signals from or activating nerves. This could be used as a synthetic neural connector, bridging a severed nerve or nerve fiber.

Elements with some temporary mechanical function could be inserted in membranes (Fig.4A - 4C). Insertion devices of this kind could be used for mounting a hole through a membrane such as commonly used in ear surgery for pressure equilibration. Making these as microdevices will much decrease the effort to place and remove the inserted devices and to keep them in place during the desired time period.

Clips, stents, finger arrays and insertion devices, once applied, could be resorbable or permanent. They could express various degrees of stimulation of cell growth on its surfaces, various degrees of anti-thrombotic activity as well as different antibiotic activities. They can also be carriers of various biochemical or biological components.

The necessary elements to accomplish these functions are the electrochemically activated micromuscles, built by micromachining thin metal and polymer layers (Elisabeth Smela, Olle Inganäs and Ingemar Lundström: "Controlled Folding of Micron-size Structures", Science 268 (1995) pp.1735-1738) or only polymer layers. These actuators can be produced in sizes from micrometers to centimeters, and operate well in biological fluids such as blood plasma, blood, buffer and urine. They are therefore suitable tools for micro invasive surgery inside the body.

The versatility of construction and the speed of response, as well as the force of these actuators render them as one of the best types of microactuators inside the body. An international patent covers one route of fabrication of such devices (A Elisabeth Smela, Olle Inganäs and Ingemar Lundström: "Methods for the fabrication of micromachined structures and micromachined structures manufactured using such methods ", Swedish patent application number SE 9500849-6, March 10, 1995 in succession also a PCT and international patent).

Prior art

The combination of microactuators and catheters are not well documented in the literature. A patent search reveals a few examples but none that describes the use of microactuators as tools housed inside a catheter; several examples of microactuators use to position a catheter are to be found in the following patents

US5771902	Micromachined actuators/sensors for intratubular positioning/steering
US5819749	Microvalve
WO9837816A1	Microfabricated therapeutic actuators
WO9739688A2	Method and apparatus for delivery of an appliance in a vessel
WO9739674A1	Spring based multi-purpose medical instrument
US5855565	Cardiovascular mechanically expanding catheter

Several mechanisms are suggested for the microactuators in these applications, found among shape memory alloys (including polymeric materials) and piezoelectric materials. The use of conjugated polymers in micromuscles is not documented for catheter tools. Our novelty and innovation therefore resides in the use of microactuators based on conjugated polymers being electrically operated and mounted in or on a catheter or needle, to be positioned with the help of the catheter, and then activating the microactuator structures carried on the needle. The microfabrication of such microactuators renders possible a number of geometries from-10 µm and larger, difficult to produce by mechanical production techniques. They may be produced by use of the method presented in patent A above and then mounted in or on the needle or catheter, or they might be produced by novel manufacturing methods. With the help of this invention, completely novel microsurgery tools are available.

The production of individually actuated tool arrays render little difficulty beyond that of producing the individual tool; we have to see that electrical contacts are supplied to actuate each microactuator separately. This can be done by wiring the single microactuator, to be used as the working electrode; the catheter is then used as the counterelectrode, and will be able to supply all the charge that we ever need to actuate all those microactuators. As wires may easily be produced in width down to 10 μm with photolithography or with soft lithography, we will be able to put at least 50 microactuators along the tool array located in/on a needle of 1 mm width, with the simple philosophy of putting down parallel conductor wires. Should we need more, more elaborate addressing schemes might be needed.

Should a necessity for three electrode systems be found in any of the applications, microfabricated reference electrodes or macrosize reference electrodes carried on the catheter housing offers a solution for this problem.

Should the tool arrays be collectively addressed, and the tool array is designed to set free the outermost clip on actuation of all the clips, we will need a mechanism of confining the movements of all but the outermost clip. This is done by assembling the clip array into a cylindrical housing, preferably the catheter, prior to insertion in the body. The cylindrical housing is now confining the motion of microactuators, which search in vain to expand the strong metal casing on operation. When the outermost clip C1 is actuated, the clip is opened; likewise is the next-to-the outermost clip C2 partially free to move as it is protruding outside the cylindrical housing. Therefore the partial opening of C2 sets C1 free, as well as opens it up for subsequent spontaneous closing on the site to be clipped.

Figure captions

Figure 1A - 1C shows clips and clip arrays, where the clips are mounted in sequence, and area confined by a cylindrical housing, and where the activation of the outer most clip C1, opening up the clip to join the open structure W1, and then being set free by the simultaneous operation of C2, so as to be left at the structure W1, holding the structures together.

Figure 2 shows tubular tweezers, tweezers and knifes, based on microactuators. The indicated movement is driven by microactuators properly mounted and designed.

Figure 3A - 3B shows a neural connector, where a number of small fingers coil around a cylindrical nerve to make a tight hold the nerve. Two separate nerves are here joined with the help of a common neural connector, which would be desired for accomplishing regrowth of the nerves. In addition, small electrodes can be fashioned along with the microfingers, and be used to sense or excite nerve signals.

Figure 4A - 4C. An insertion devise, for making a temporally permanent hole through a membrane. The devise is housed in a catheter/cannula/needle and is inserted through the membrane so as to make the devise form a hole through the membrane.

Figure 5A - 5B show a stent device.

CLAIMS

1. Tool arrays for biomedical surgery,
characterized in that
(i) the tools consist of layered polymer micromuscles arranged to induce geometrical changes and movements via an electrochemically induced change of volume in at least one polymer layer, and
(ii) the tool or tool arrays are mounted on a carrier having the form of a needle being inserted into a cannula/catheter through which the tools can be electrically actuated via external means to induce a mechanical movement to act upon biological structures.

2. Tool arrays according to claim 1, characterized in that the layered polymer consists of a single layered polymer.

3. Tool arrays according to claim 1, characterized in that the layered polymer consists of a bi-layered polymer.

4. Tool arrays according to claim 1, characterized in that the layered polymer consists of multilayered polymer and metal layers.

5. Tool arrays according to one or more of claims 1-4, characterized in that the mechanical movement is used to position a biological structure.

6. Tool arrays according to one or more of claims 1-4, characterized in that the mechanical movement is used to hold a biological structure.

7. Tool arrays according to one or more of claims 1-4, characterized in that the mechanical movement is used to cut a biological structure.

8. Tool arrays according to one or more of claims 1-4, characterized in that the mechanical movement is used to dilate a biological structure.

9. Tool arrays according to one or more of claims 1-4, characterized in that the mechanical movement is used to fortify a biological structure.

10. Tool arrays according to one or more of claims 1-4, characterized in that the mechanical movement is used to implant a biological structure.

11. Tool arrays according to one or more of claims 1-10, characterized in that a number of identical tools are located on a tool array extending along a length of the cannula, catheter or needle, and wherein the actuation of a tool closest to the exit of the catheter is arranged to release a tool from the tool array and is arranged to leave it at the point of exit of the catheter in order to mount the tool at/in some biological structure .

12. Tool arrays according to claim 11, characterized in that a number of identical tools are located on the tool array extending along the catheter or needle and where each tool is arranged to become individually actuated.

13. Tool arrays according to claim 11, characterized in that a number of non-identical tools are located on the tool array extending along the catheter or needle and where each tool is arranged to become individually actuated.

14. Tool arrays according to one or more of claims 1-13, characterized in that the individual tool is a clip arranged to join biological tissues or tissue parts, and arranged to hold the said tissues or tissue parts to allow healing.

15. Tool arrays according to one or more of claims 1-13, characterized in that the individual tool is an expandable cylindrical object designed to be inserted, in a contracted state, into a biological tube, and arranged to become expanded to keep said tube in an expanded state or to join two or more biological tubes.

16. Tool arrays according to one or more of claims 1-13, characterized in that the individual tool is a scissors.

17. Tool arrays according to one or more of claims 1-13, characterized in that the individual tool is a knife, which is arranged on an actuator, being arranged for linear and/or angular movement.

18. Tool arrays according to one or more of claims 1-13, characterized in that the individual tool is a sharp needle that is arranged on an actuator being arranged for linear and/or angular movement.

19. Tool arrays according to one or more of claims 1-13, characterized in that the individual tool is a dilator.

20. Tool arrays according to one or more of claims 1-13, characterized in that the individual tool is a clamp.

21. Tool arrays according to one or more of claims 1-13, characterized in that the individual tool is a tweezers.

22. Tool arrays according to one or more of claims 1-21, characterized in that the polymer micromuscles are built of layers, of which at least one is a conjugated polymer.

23. Tool arrays according to claim 22, characterized in that the conjugated polymer is selected from the group consisting of pyrrole, aniline, thiophene, para-phenylene, vinylene, and phenylene polymers and copolymers, including substituted forms of the different monomers.

24. Tool arrays according to claim 1, characterized in that the tool is built of bi-layered polymer, where the electrically activated volume change of said, at least one conjugated polymer is arranged to cause a bending of said bi-layer.

25. Tool arrays according to claim 1, characterized in that the tool is built of multilayered polymer, where the electrically activated volume change of said, at least one conjugated polymer is arranged to cause a bending of said multilayer.

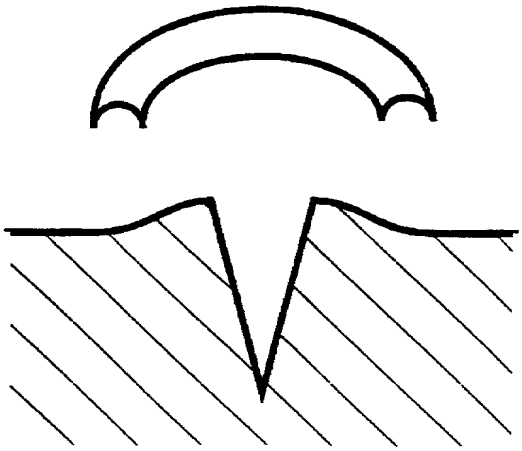

Fig 1a

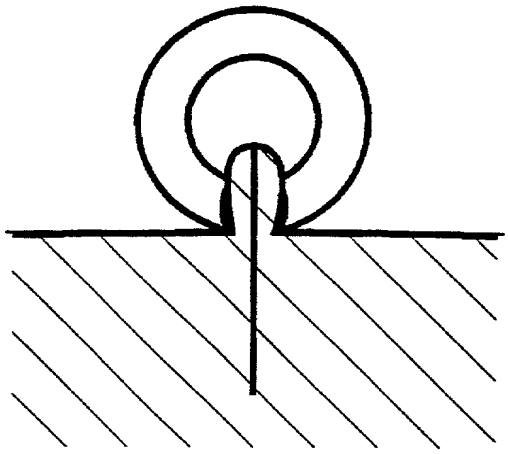

Fig 1b

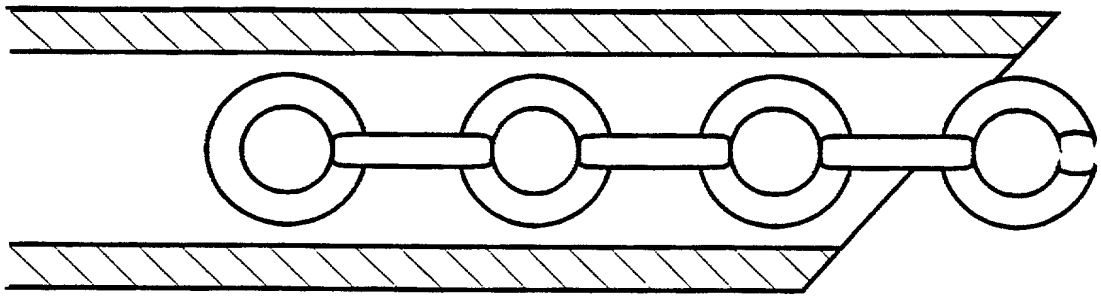

Fig 1c

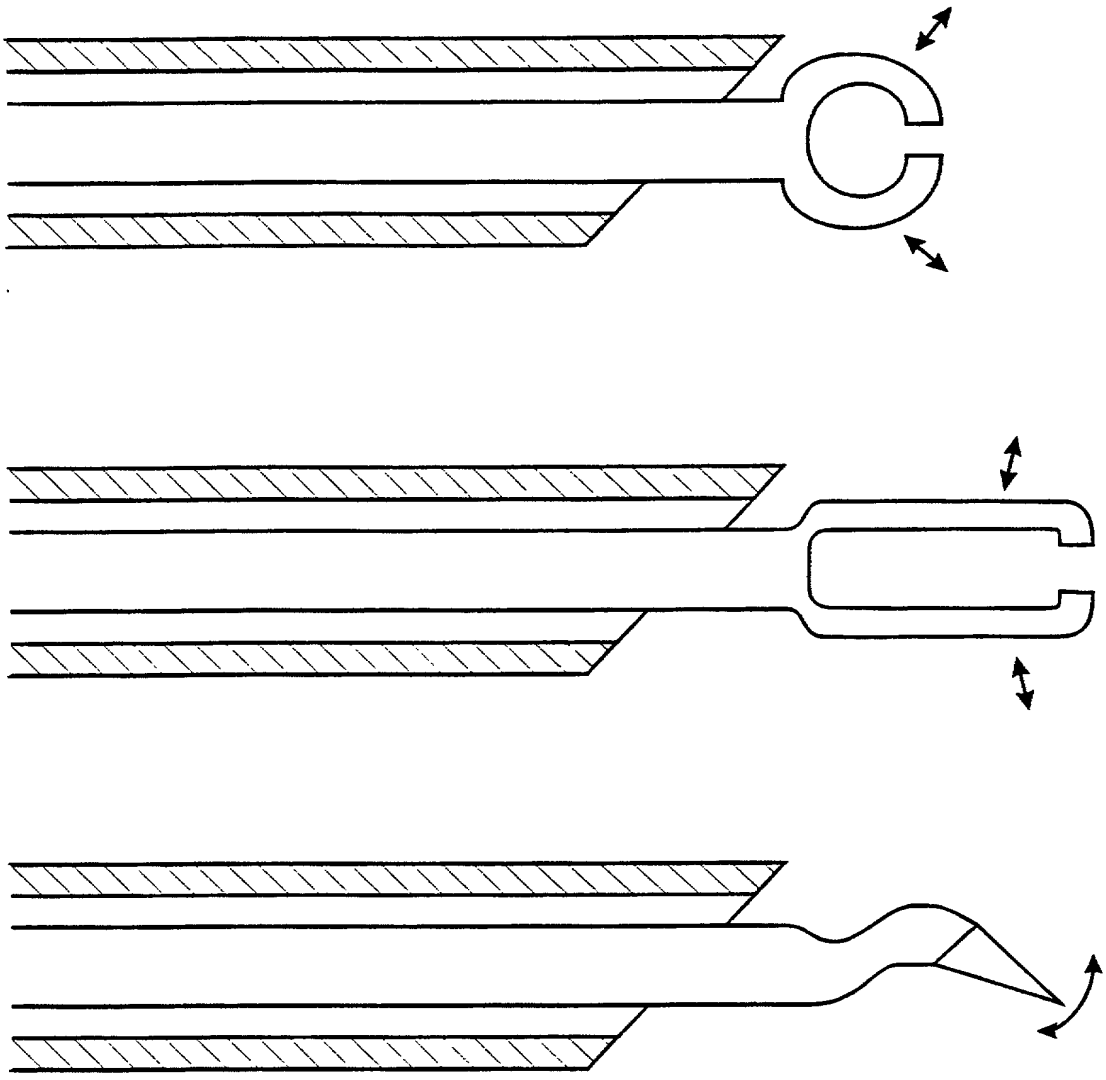

Fig 2

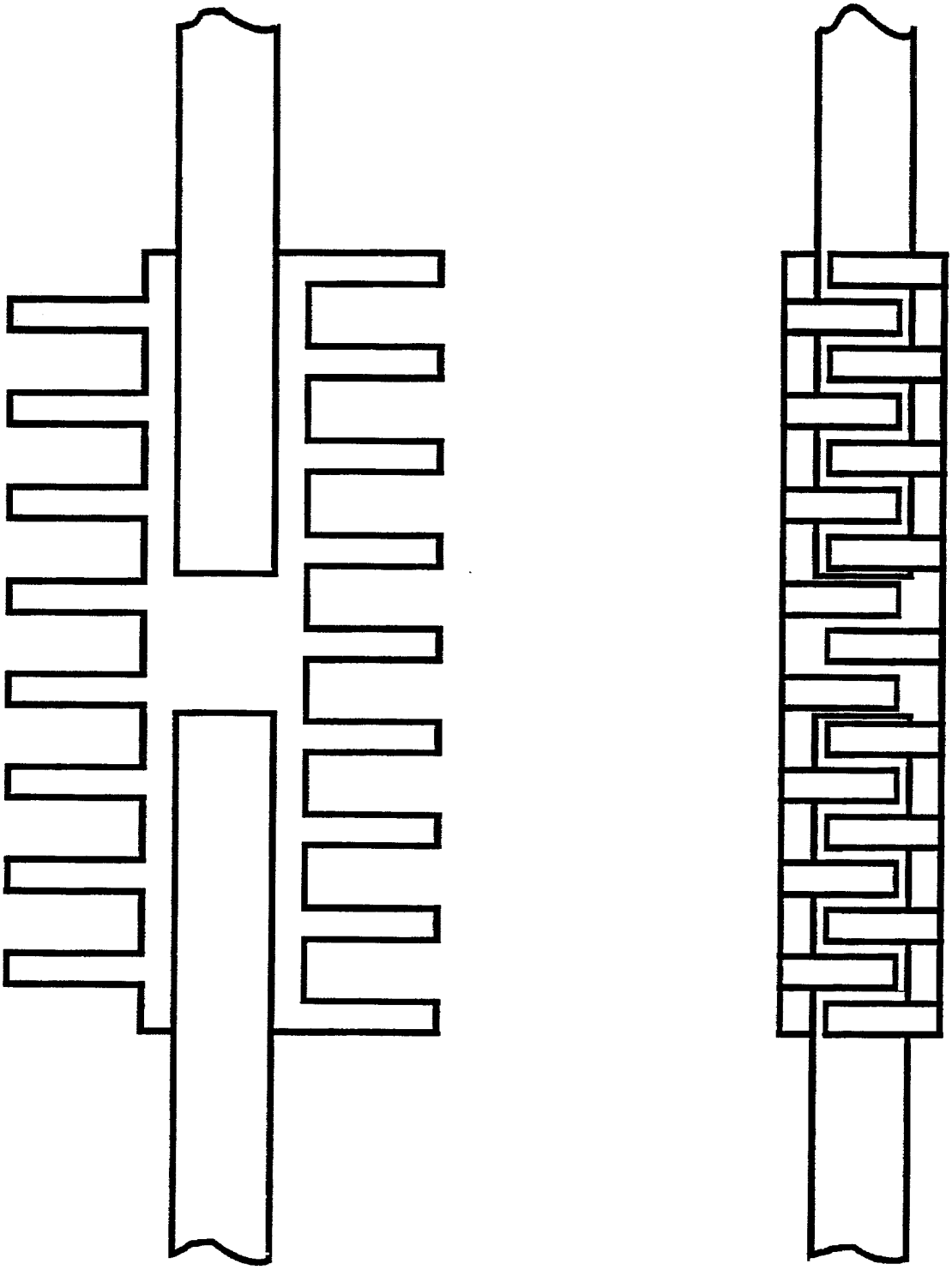

Fig 3a och 3b

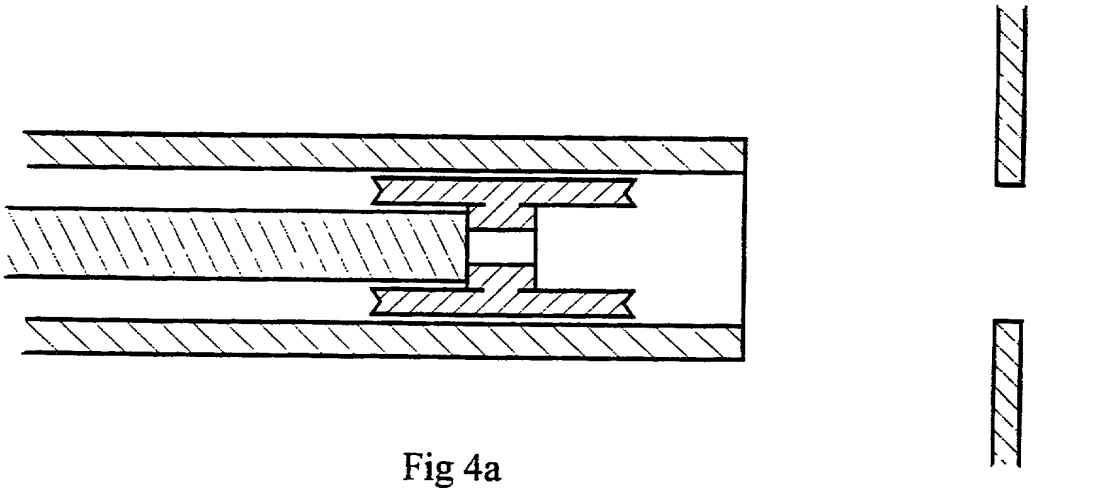

Fig 4a

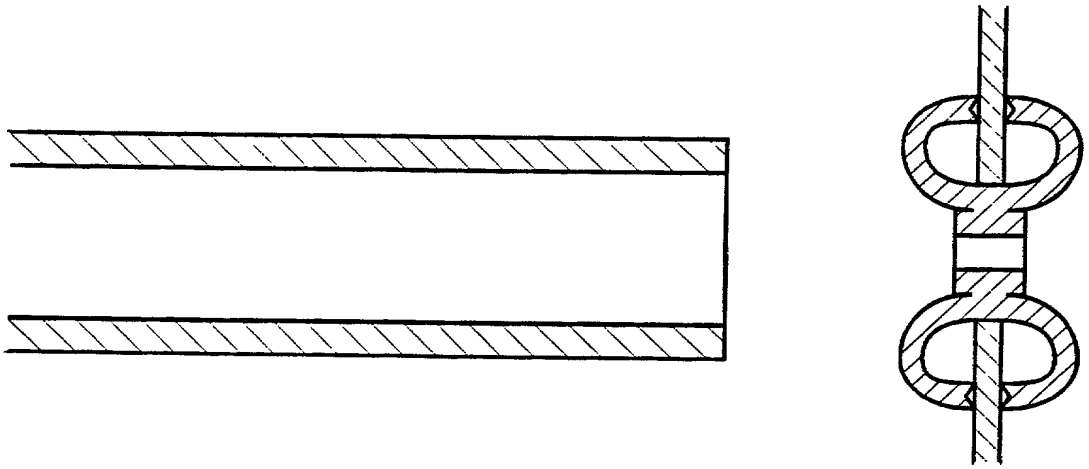

Fig 4b

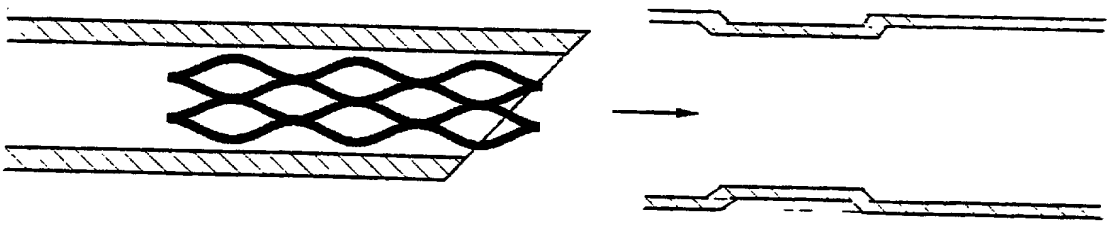

Fig 5a

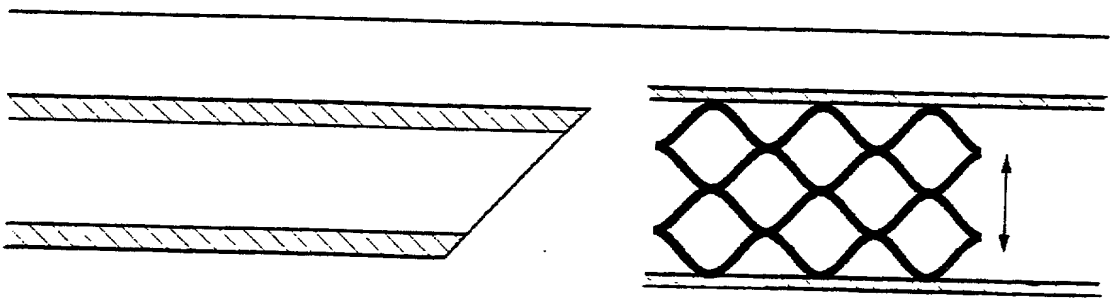

Fig 5b

DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION

Attorney Docket No: _____

First Named Inventor: *Olle Inganäs*

Complete if known: Serial No: _____ Filing Date: December 19, 2001

Group Art Unit: _____ Examiner: _____

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled *Micro tools* _____, the specification of which: ☐ is attached hereto **or** ☐ was filed on _____ as application Serial No. _____, and was amended on _____(if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, S. 1.56(a).

I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or 365(b) of any foreign application(s) for patent or inventor's certificate, or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below any foreign application for patent or inventor's certificate or of any PCT international application having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s):

			Priority Claimed	Certified Copy Attached
9902348-3 (Number)	*Sweden* (Country)	*June / 21 / 1999* (Month/Day/Year Filed)	☒ Yes ☐ No	☐ Yes ☐ No
_____ (Number)	_____ (Country)	_____ (Month/Day/Year Filed)	☐ Yes ☐ No	☐ Yes ☐ No

I hereby claim the benefit under 35 U.S.C. 119(e) of any United States provisional application(s) listed below:

Application No: _____ Filing Date: _____

I hereby claim the benefit under 35 U.S.C. 120 of any United States application(s), or 365(c) of any PCT international application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C 112, I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

PCT/SE00/01286	*June 18, 2000*	
US Parent Application or PCT Parent Number	Parent Filing Date	Parent Patent Number (if applicable)

And I hereby appoint HAYES, SOLOWAY, HENNESSEY, GROSSMAN & HAGE, P.C., a firm composed of Oliver W. Hayes, Reg. No. 15,867; Norman P. Soloway, Reg. No. 24,315; William 0. Hennessey, Reg. No. 32,032; Susan H. Hage, Reg. No. 29,646; Steven J. Grossman, Reg. No. 35,001; Christopher K. Gagne, Reg. No. 36,142; and Edmund Paul Pfleger, Reg. No. 41,252, or any of them, of 175 Canal Street, Manchester, New Hampshire 03101 (Telephone: 603-668-1400) my attorneys with full power of substitution and revocation, to prosecute this application and to transact all business in the Patent Office connected therewith.

Please direct all future correspondence in connection with this application to the attention of **Norman P. Soloway** HAYES, SOLOWAY, HENNESSEY, GROSSMAN & HAGE, P.C., 175 Canal Street, Manchester, New Hampshire 03101 (Telephone: 603-668-1400).

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full name of sole or first inventor: *Olle Inganäs*

First Inventor's signature _____ Date 2001 12 10

Residence: *Wernersgatan13, S-582 46 Linköping, Sweden* SEX

Citizenship: *Sweden*

Post Office Address: *Same as residence*

Full name of second joint inventor: *Edvin Jager*

Second Inventor's signature _____ Date _____

Residence: *Rydsvägen 220 B, S-584 32 Linköping, Sweden* SEX

Citizenship: *Sweden*

Post Office Address: *Same as residence*

I hereby claim the benefit under 35 U.S.C. 120 of any United States application(s), or 365(c) of any PCT international application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C 112, I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full name of sole or first inventor: *Olle Inganäs*

First Inventor's signature _____ Date _____
Residence: *Wernersgatan13, S-582 46 Linköping, Sweden*
Citizenship: *Sweden*
Post Office Address: *Same as residence*

Full name of second joint inventor: *Edwin Jager*

Second Inventor's signature _____ Date 14-12-'01
Residence: *Mjärdevigatan 9, S-584 22 Linköping, Sweden*
Citizenship: *Sweden*
Post Office Address: *Same as residence*

3-00

Full name of third joint inventor: *Anders Selbing*

Third Inventor's signature _____ Date 2001-12-14
Residence: *Lindaliden 3, S-589 35 Linköping, Sweden* SEX
Citizenship: *Sweden*
Post Office Address: *Same as residence*

Full name of fourth joint inventor: _____

Fourth Inventor's signature _____ Date _____
Residence: _____
Citizenship: _____
Post Office Address: *Same as residence*

Full name of fifth joint inventor: _____

Fifth Inventor's signature _____ Date _____
Residence: _____
Citizenship: _____
Post Office Address: *Same as residence*

Full name of sixth joint inventor: _____

Sixth Inventor's signature _____ Date _____
Residence: _____
Citizenship: _____
Post Office Address: _____